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Automatic Formal Verification for EPICS

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The Clinical Neutron Therapy System (CNTS) is a unique cyclotron-based radiation therapy machine at the University of Washington Medical Center. CNTS uses EPICS in its control system. This is a safety-critical medical application so we have undertaken a research project to supplement our usual software quality assurance by formal verification. The project includes an intensive review, analysis, and re-implementation of parts of EPICS. Several tools are under development. The EPICS Symbolic Evaluator automatically checks properties of an EPICS database. It either confirms the property or provides a counterexample. The EPICS Verified Interpreter is a re-implementation of the EPICS database engine, proved correct with an automated theorem prover, and validated by automated differential testing against an EPICS IOC. The EPICS Verified Compiler will compile an EPICS database to a standalone program that replaces the present EPICS runtime with a smaller trusted core.

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